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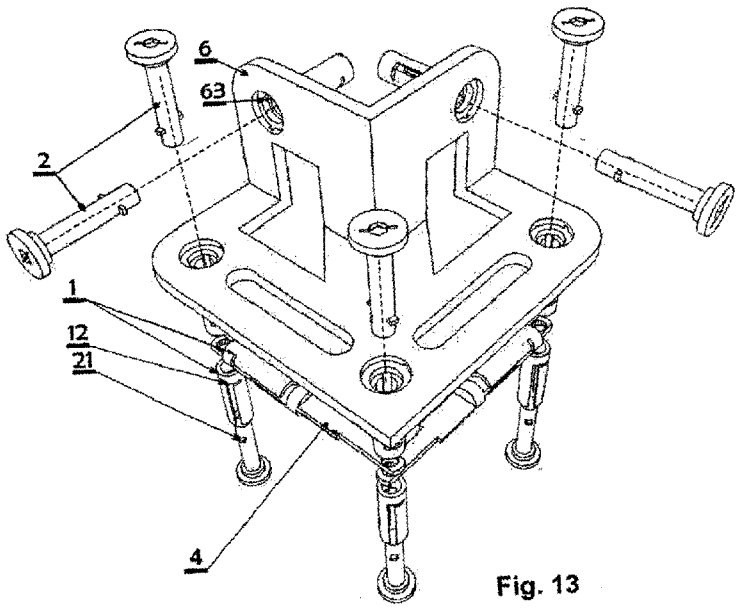


Fig. 13

(57) Abstract: The aim of the invention is to design a lock being part of a connecting set for building construction beams, in particular small buildings with wooden construction, allowing for a free connection, disconnection, modification from the perspective of assembling, disassembling and rebuilding. The aim of the invention is also to provide a method of joining structural elements allowing for fast assembly of a wooden construction of a building.

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THE LOCK OF THE CONNECTION SET FOR STRUCTURAL ELEMENTS, THE CONNECTION SET WITH LOCKS AND THE METHOD OF JOINING CONSTRUCTIONAL ELEMENTS WITH THE USE OF THE CONNECTION SET

The subject of the invention is a lock of a connection set for structural elements, particularly in the form of wooden beams being the supporting structure of a building. The subject of the invention is also a connection set with locks for structural elements in the form of wooden beams being the supporting structure of a building. The subject of the invention is also the method of joining structural elements with the use of the connection set.

In carpentry works, the most frequently used are flat connectors, which allow only for stiff one-time connections made with nails and screws.

Mounting locks are used to mount in the construction industry. They are the elements which facilitate, accelerate and improve the connections between individual elements. Their increasing presence in the market shows that there is a need for more and more new elements allowing more and more complicated connections by introducing an element facilitating and improving the quality, stiffness and possibilities of connections.

An additional advantage of mounting locks is their application in connections between more than one plane. They can be responsible for a "3D" connection, that is joining 3 planes simultaneously by using carrying structures in angular elements, making a specific basket joining the carrying elements of a given systemic construction, for example from sandwich plates used to build objects of street architecture, façades and small utility buildings. Each of these elements combined into one structure will allow for the creation of an element of appropriate statics and strength of the materials determined by separate regulations.

Elements of steel connectors allow for standardising work, elements and all procedures associated with mounting individual fragments, parts and modules of an object undergoing combination, modernisation or expansion. Thanks to using mounting locks, it is easy to get increased possibilities of connections with their precision and resistance. Using locks in small structures allows for facilitating of mounting individual constructional elements.

In the offer of producers there are many elements of steel connectors but they are responsible for flat and one-time connections and combinations – and that means that mounting such an element allows for a permanent connection without the possibility of modifying a given segment.

An increasing application of these elements in many fields of construction can be noticed, in the first place in the wooden construction industry, where the stiffness of connections is extremely important. Each of the used elements improves and ensures better mechanical and static characteristics of a structure or an element in which it was used, and thanks to introducing these elements it is easy to economise during the investment process. Modularity and application of connections of locks and ferrules allow for acceleration of all the works and due to this, reduction of costs associated with doing the work.

A solution is known from the Polish application for invention number P.337240 entitled "Jointing element for coupling together at least two wooden components of a structure and their associated gusset plate", in which two wooden elements are connected with the help of a gusset plate of the T-section. The foot of the plate is screwed down with the help of screws to one of the elements and the perpendicular part of the plate is placed in an intentionally created gap of the second element and screwed down to it with screws.

Other known solutions are based on various inserts equipped with blades perpendicular to both sides of their surface. These inserts are of different shapes: rings, rectangles, stars or triangles, just like the one known from the Polish utility model application number 109 664: "A mechanical connector to connect elements

of wooden or plastic structures". This connector comprises a flat body from the steel sheet in the form of a triangle with cut corners.

There is known from the utility model application Wu 94153 a sleeve anchor consisting of a sleeve with slits, screws with an expansion mandrel, a washer and a nut, it has a sleeve of the ellipsis section, made from the coiled flat bar with external triangular recesses along the horizontal axis and collars along the longer sides, and the screw has an expansion mandrel in the shape of a three-sided cone.

In the utility model description Ru 53785 a connector of a cabinet or counter is presented. The connector has three cylindrical mandrels situated in three perpendicular to each other axes and connected by their endings, creating in this way a monolithic structure. The mandrels have axial gaps situated on the same plane, and the third mandrel has an axial gap situated on the plane perpendicular to the axial gaps.

There is known from the utility model description Ru 54219 a corner angle connector which is a spatially shaped element with three joining walls, mutually perpendicular, having an outline of the edge of each wall approximately perpendicular, matching the outline of the edges of the socket of the section and having in the middle part of every wall a hole for screws of the retainer in the form of an expander situated in the socket of the section in the shape of a ribbed wall plug and a screening section.

There is known from the utility model description Ru 54253 a corner angle connector which is characterised by the fact that it is a spatially shaped element, whose two joining walls, perpendicular to the third joining wall are in the planes meeting each other at the acute angle, having an outline of the edges of each wall matching approximately the outline of the edges of the socket of the section and having in the middle part of each of the walls a hole for screws of the retainer in the form of an expander situated in the socket of the section in the form of a ribbed wall plug and a screening section.

There is known from the utility model description Ru 54492 a corner spatial

connector, which consists of three cuboidal arms combined together in one point. In the horizontal plane the cuboidal arms make the angle of 120°, in the vertical plane the cuboidal arm make with the other cuboidal arms the right angle. The external corner outline has a shape of two trapezoid-like symmetrical, joined together planes, bent in the right angle.

There is known from the utility model description Ru 54770 a furniture joining wall peg, which is made of a sleeve having an internal cuboidal hole, inside which a flat element has been placed blocking sliding of the cut part of the sleeve of a smaller diameter. The sleeve has two external diameters, a smaller one and a bigger one. On the length of the diameters, the external surfaces of the sleeves are aslant backward notched to each other with following one another conic rings.

There is known from the utility model application Wu 102280 a connector of constructional elements, which is a combination of two profiles, where to the profile a latch is screwed in. The latch is entered into the shapes of the profile. The latch is in the transverse section shaped like the capital "T" letter and on the edges of the longitudinal planes it has radial curves, whereas the width of these planes equals the width of the internal shapes of the profile.

There is known from the utility model application Wu 102402 a connector, especially furniture connector, which has a shape of a sleeve with a through hole, threaded from the inside. On the axis of the sleeve there is a hole with a pin. The axis of the hole is perpendicular to the axis of the sleeve.

There is known from the utility model application Wu 104139 a corner angle connector, destined to join sections with the outline of the transverse section, similar to the triangle, with cuboidal socket to fix the detent element, in the spatial node and mounting on them walls, panels and shelves in the structures of the partition walls quickly dis-mountable, cabinets, showcases. The corner angle connector, in the form of a stiff shaped element with a threaded hole and a screw, is characterised by the fact that it is made by small sleeves perpendicular to each other, connected with a node, each of which has four longitudinal ribs, and through holes threaded for screws and

on the external side, a screening section.

A mounting connector, which is characterised by the fact that it has the shape of a straight segment of the flat bar, bent in both ends at the right angles, is presented in the utility model description Ru 59706. On the one end it has a fixed permanently rivet nut, and on the other, a kidney-shaped slot.

There is known from the utility model description Ru 58344 a connector of wall elements, destined to join individual wall elements into one structure. The connector of the wall elements is a channel section, whose each side wall with the base makes the right angle, the upper edges of the side walls are enlarged with the walls, situated parallel to the base and their external edges on part of their surface have a slant in the right angle and the bottom surface of the base has two rectangular recesses, situated parallel to the longitudinal axis of the section, whereas on the surface of the upper base in its longitudinal axis there is a groove, whose two walls create the right angle.

The utility model description Ru 58326 describes a connector of the poles of the construction wall, destined to join individual wall elements of the poles of the construction wall into their construction. The connector of the poles of the construction wall is a shell section, which is created by three joined together rectangular geometric figures of different sizes, set together in one longer side of the previous, and each following one is smaller than the previous, and on the external surface of the smallest figure and the upper corners of the middle figure and on the surface of the longer side of the biggest figure, symmetrically to the axis, there are two-arm projections of the radial outline, whereas all the parts of the section create a monolith.

There is known from the Polish application P.295435 a connector to mount the door frame. The connector has two elements, whereas the ending of the second element is rotationally joined with the centre of the first one, which in its ending has holes. The second element has a longitudinal hole, on the sides of which there are holes and between the longitudinal hole and the first element there are two contractions.

In the patent description PL169144 there is presented a connector to join typical constructional elements, it is joined inseparably with one of the joined constructional elements, and at least with one further constructional element it is connected separably. The connector between the top and bottom panel has ribs situated transversely in relation to them, between which there is at least one through hole situated between the sides of the upper and lower planes placed in front of each other. The ribs have a transverse section of the shape which acts in a hardening way.

In the Polish application P.305105 we know of a locking mounting system made from the posts and connecting elements, where the posts have on the rim of one external side the first sealing strip, fixed in the gripping inlet in the shape of the letter U, and the transverse connecting elements are placed transversely to the posts and adhere to them frontally. The transverse connecting elements have on the rim of the external side the second sealing strip and from the frontal side the scallop to be put on the post. The transverse connecting elements have the first flat external area, on which there are fixing ribs of a mushroom shape. The thickness of the first sealing strip equals the thickness of the second sealing strip and the flat external area. Longitudinal connecting elements are placed parallel to the post and have the second flat external area, on the rim of which there is the third sealing strip, whereas the longitudinal connecting elements have from the frontal side the scallop destined to be put on the suitable transverse connecting element, and the thickness of the second external area increased by the thickness of the third sealing strip equals the thickness of the second sealing strip.

Presented in the application P.311151 sleeve anchor consists of a nail, sleeve and washer. The surface of the nail has at least two threaded spheres. The sleeve has two longitudinal incisions disappearing in its upper part and at least two longitudinal embossed areas proceeding towards the axis on each part of the surface of the sleeve, separated by longitudinal incisions. Before pinning down the sleeve anchor, the nail is placed in the sleeve in such a way that the unthreaded parts of the nail's surface are inside this part of the sleeve whose external surface is devoid of embossed areas and

the parts of the nail which are threaded, are inside that part of the sleeve whose external surface is devoid of embossed areas.

There is known from the patent description PL193523 "the mounting set to erect constructions", which deals with the construction profile to the mounting set to erect constructions. To produce market and display stands, a large number of profile pipes of various transverse sections is used. However, such pipes normally cannot be mounted from the frontal side on the responding profiles, unless they have been appropriately shaped before. It has been suggested to place the connecting element with at least one hollow chamber for the clamping mechanism from the frontal side with the open ending of the profile pipe and to secure. In this way it is possible to shape profile pipes of various transverse sections to place one on the other from the frontal side.

There is known from the application P.351920 a mounting and hinge connector to a panel and panelling system containing such connectors. The panels are connected along the frame element with one or many carrying elements of some angle of inclination, with the help of mounting and hinge connections, which can be regulated depending on the angle of inclination, whereas the connectors are also the hinge connectors of the opening panels. Every connector has a fastening part to join with the arm of the panel and a regulating part joining the fastening part with the hinge part.

There is known from the application P.352787 a connector, especially for the elements of the furniture structures, which is an element in the shape of the channel section whose top and bottom walls have the outline of the even-armed trapezes, shorter arms are profiled on the arch and the front side has an hole for the screw, whereas the side edges and responding edges symmetrically placed, top and bottom walls have protruding, situated askew, elements in the form of teeth.

In the patent description PL206417 there is described a method of joining elements of wooden structures and a connector for wooden structures. The connector is a bar threaded on one side and on the other ended with a blade in the shape of

a pyramid. The shape of the basis of the pyramid makes it possible to put the connector into the screwgun, thanks to which the connectors are placed in the previously marked points on one of two surfaces of the elements' point of contact after previously being prepared for the set screw. Later, with the help of the pressure, the joined elements are pressed down, making the connectors blades sink into the other surface of the point of contact, and later the set screw is put.

From the application number P.359329 entitled "A connector to mechanically join construction elements" we know of a connector to effectively join elements or construction sets of very diversified constructions with the surfaces of walls, ceilings and floors of buildings or scaffoldings, whereas the connector has two connector halves tacked with each other by the joining movement fixed on the joined elements or construction sets with the help of fixing elements, whereas the connector halves and the fixing elements have the dimensions so chosen, that with the action of the strengths connected with the exploitation, the given mechanically stable condition of the connected elements or construction sets is kept. According to the invention, inside the connector halves the halves of wire joints are placed to plug in the conduits of liquid and gas, relatively electric or signal conduits, whereas in the working condition the halves of the wire joints are connected with the end sections of the linked conduits, while the connector halves have recesses, through which the conduits are taken out, and connector halves in the joined working condition are the casing for the halves of the electric joints, whereas the casing is so shaped that the halves of the electric joints and the end sections of the joined conduits are protected against the harmful impingement of the working conditions or the environment conditions.

There is known from the patent description number PL201441 a nodal connector to fix one mounting rail in abutting relationship to the second mounting rail and perpendicular to each other. To enable the mounting saving time and possible to be done by only one assembler, it has been proposed according to the invention that the nodal connector has a joining device comprised of the angle iron with two arms.

One arm of the angle iron is fixed in the hole in the nodal connector, and the other is fastened to into the assembling rail put to the socket of the nodal connector.

In the patent description PL210226 a set of elements joined in the modular system and stretched connector is presented. The set comprised of at least one plate element and at least one stretched connector, which possesses at least one cylindrical recess of the transverse section in the shape of the segment of a sphere, whereas obtuse angles of the sections of the individual holes are bigger than 180° and smaller/equal to 360°, and each plate element has at least one connecting edge, interconnected with choosing the connector of the angle of the section smaller than 360°, characterised in that the section of the connecting edge consists of the cylindrical part interconnected with the stretched connector, whose shape matches the shape of the recess and with the blocking part, which is the section of the surface, blocking the spin of the stretched connector around the connecting edge of the plate element. The subject of the invention is also a connector and a plate element. The invention is used in many different fields, such as a display set, to display goods in a shop, as a set to play or as a construction of a light package.

In the protection descriptions of the utility models PL 56901 and PL56764 construction cross-shaped joints to connect glass plates have been revealed.

From the application number P.391893 we know of the method of mounting box walls, set to assembly box walls and a mounting connector. The method of assembling the box walls, in which the box walls are set together and fixed with the construction poles, is characterised in that the box walls are separately connected with the post or posts with the help of mounting connectors. Separate connection of the box walls with the post means that the mounting connectors of the box wall are put in the holes placed in the surfaces of the sides of the post. While mounting, the lower element of the wall is put on the horizontal beam, which with its endings is placed in the settling cubes placed in the bases of the posts, the screen is put on the bottom element and the screen is joined with the post. The set to mount the box walls is the module which consists of at least one box wall and at least one post, whereas

the wall is equipped with at least one mounting connector. The mounting connector is built from the base, from which the elements are taken out which make it possible to couple the connector with the wall elements and the catching part containing at least one catch. Between the base and the catching part there is a recess.

There is known from the application number P.391932 a connector which has sleeves and collars and elastic bellows characterised in that the internal sleeve has a cavity of the angle ℓ up to 355° and a sliding connection with the middle sleeve having in its upper part an internal collar and in the lower part a vertical cavity and on it in a sliding way the external sleeve is put which has in its lower part a threaded hole and in the upper part the middle collar shaped like a channel having holes in the arms, which are separately connected with the upper collar in the shape of the channel having holes in arms.

There is known from from the application description number P.393080 a method of connecting plate elements, especially walls and shelves of bookcases and a connector to join plate elements, especially walls and shelves of bookcases. The subject of the invention is the method of connecting plate elements, mainly those which are perpendicular, especially walls and shelves of bookcases and the connector to join plate elements, especially walls and shelves of bookcases. The joining method is that into the hole of the lower vertical section a vertical pin is put with the jammed element put on it. The jammed element is placed on the pin movably or is permanently connected to it. Then with the holes the shelves are put onto the jammed element until the fronts of the shelves meet in the middle of the edge of the lower wall, and the connection is strengthened by putting the pin on the upper sections of the vertical wall. The set is jammed. The connector is a flat jammed plate, put on the pin aslant or in another version a jammed element is in the shape of a flat V letter.

There is known from the application number P.365051 a set to mount the building construction, in which the upper and lower foundations as well as the posts, struts, girders, beams etc., are produced in the factory and destined to be joined with joints in the shape of the swallow's tail, whereas all the elements are placed exactly

according to the dimensions on the drawings of the building, and then they are transported to the building site and mounted in such a way that the tongue of one part of the joint is put into the suitable ditch of the second part of the bond after placing suitable parts.

There are known from the patent description PE0054802 internal crossed shaped connectors with holes, blocked with pivots in the holes of the two connecting beams.

There are known from the patent description EP0063662 beams prefabricated to be mounted, and all the cantilevers and longitudinal girders are made with the holes with a permanent scale, in which plug-in connectors are placed linking together beams and modules.

Various shaped connectors to connect construction elements of buildings are known from, among others, descriptions EP0072139, EP1413686, EP1572390, EP1995388, EP138643, EP2527547.

There is known from the patent description EP0228241 a connector of beams which in the node has internally connected with each other clamping rings of the beams with the holes blocking the beam movement in relation to the clamping ring.

There is known from the patent description EP0127095 a sleeve with moving dowels in through holes, which are moved outside and blocked with the moved to the sleeve mandrel.

The aim of the invention is designing a lock being part of the connecting set for building construction beams, in particular small buildings with the wooden construction, allowing for a free connection, disconnection, modification from the perspective of assembling, disassembling and rebuilding. The aim for the invention is also working out a fast way of doing the works with the wooden construction of a building.

The subject of the invention in the form of the lock is a sleeve which has at least one longitudinal recess, preferably a cut-out of the wall connected in the bottom part with an annular recess, preferably an annular gap on part of the perimeter and the key, which has at least one flat tongue in the plane perpendicular to the axis of

the rotation of the key and is of greater length in the end section from the flat tongue than is the length of the sleeve from the annular gap. Preferably, the key has an additional tongue shifted in relation to the first tongue in the same way as the distribution of an additional longitudinal cut-out with an annular gap in relation to the first longitudinal cut-out with the annular gap, whereas the additional longitudinal cut-out of the wall is joined in the bottom part with the additional annular gap, which is in a different distance from the end of the sleeve than the first annular gap. The key has a head equipped with a projection and/or a recess with the press area.

The subject of the invention is the plug-in connector which in the middle of its length has a projection, preferably annular, protruding outside the diameter of the inner hole of the sleeve of the lock, whereas the ends of the plug-in connector with holes are preferably flat and are more than twice longer than the sleeve. The protruding from the sleeve end section of the key of the lock in the working position is placed in the hole of the plug-in connector. The distance between the holes on the length of the plug-in connector is the same as the distance of the axis of the sleeve of the adjacent locks. The longitudinal edges of the plug-in connector have leading projections, preferably of the size of 0.1-0.95 of the width of the longitudinal cut-out of the sleeve. Preferably, the edge of the sleeve placed in the mounting hole of the constructional element is additionally frictionally connected on the lateral surface of the constructional element with the rail and/or on the end face with the frame. Additionally it has a shaping connector with sockets for the locks, whereas part of the sockets is in the base wall and part is in the side walls, preferably perpendicular to the wall of the base.

The essence of joining structural constructional elements using the connection set means that after placing the plug-in connector in the mounting hole of the first constructional element, preferably a wooden beam in the position where the axis of the hole of the plug-in connector corresponds to the axis of the second mounting hole of this constructional element, to the third mounting hole the other end of the plug-in connector or the second plug-in connector is slipped to the position in which the axis

of the hole at the end of the plug-in connector is within the axis of the fourth mounting hole of the second constructional element and/or another plug-in connector is slipped to another mounting hole of the first constructional element to the position in which the axis of the hole of this plug-in connector corresponds to the axis of another mounting hole, whereas the movement of the plug-in connectors is blocked by at least one key of the lock placed in the perpendicular mounting hole, after which another constructional element is moved closer and the actions are repeated until the constructional elements are joined in a node. In the beginning, before placing the plug-in connector and/or the key, at least one sleeve being part of the lock for the key is placed in the mounting holes.

The beneficial feature of the method according to invention is the possibility of almost arbitrary shaping of the beam construction with the relation to the distance of the beams and matching the wall modules put, as well as dis-mounting and forming a new shape of the construction.

The invention is presented in the picture, in which in the oblique view Fig. 1 presents the lock consisting of the key with two opposite projections on the mandrel and the sleeve with two longitudinal recesses. Fig. 2 shows the key with four projections on the mandrel and the sleeve with four longitudinal recesses. Fig. 3 presents the key partially slid into the sleeve, Fig. 4 shows the lock in the closed state, Fig. 5 shows the key of the lock alone and Fig. 6 the sleeve of the lock alone. In Fig. 7 we can see the connection set consisting of two locks and the plug-in connector, in Fig. 8 the connection set of three locks and two plug-in connectors and in Fig.9 the connection set of four locks and three plug-in connectors, in Fig. 10 the plug-in connector itself. In Fig. 11 parts of the connection set are shown from Fig. 7 placed in the axes of the mounting holes of two constructional elements. In Fig. 12 parts of the connection set placed in the axes of the mounting holes of the four constructional elements, in Fig. 13 we can see part of the connection set placed in the axes of the holes of the shaped connector and in Fig. 14 the connection set with locks fixed in the holes of the shaped connector and opposite ones. In Fig. 15 one can see

the connection set used to link four beams in the corner of the beam construction, in Fig. 16 linking five beams in the corner with the help of, at best, thirteen or fourteen locks, six or seven plug-in connectors and one shaped connector, and in Fig. 17 and Fig. 18 the shaped connector alone, in two positions, from the inside and from the outside.

According to the invention it is possible to make a lock of the connection set for the structural elements, it has a shaped sleeve **1** and key **2** with opposite tongues **21a.** The sleeve **1** has longitudinal recesses, in the shape of cut-outs **11a** of the wall connected in the bottom part with an annular gap **12a** on part of the perimeter. The key **2** has two flat tongues **21a** in the plane perpendicular to the axis of the rotation of the key **2** and is of greater length a_2 in the end section **20** from the flat tongue **21a** than is the length a_1 of the sleeve **1** measured from the annular gap **12a** till the end. The key **2** has a head **22** equipped with a projection and/or a recess **23** with the press area **23a**.

In the second example of application, which has been shown in Fig. 2 and Fig. 3, the key **2** has an additional tongue **21b** on the mandrel shifted in relation to the first tongue **21a** in the same way as the distribution on the sleeve of the additional longitudinal cut-out **11b** with an annular gap **12b** in relation to the first longitudinal cut-out **11a** with an annular gap **12a**, whereas the additional longitudinal cut-out **11b** of the wall is connected in the bottom part with the additional annular gap **12b**, which is in a different distance from the end of the sleeve **1** than the first annular gap **12a**.

Realised according to the invention, in the application shown in Fig.7, the connection set has a plug-in connector **4** on both ends, whose movement in relation to the mounting hole **50** in the working position is blocked with the lock **3.** The plug-in connector **4** in the middle of its length has a projection **42**, preferably annular, protruding outside the diameter of the inner hole of the sleeve **1** of the lock **3,** whereas the ends of the plug-in connector **4** with the holes **40** are preferably flat **41** and are more than twice longer than the sleeve **1**. The protruding from the sleeve **1**

end section **20** of the key **2** of the lock **3** in the working position is placed in the hole **40** of the plug-in connector **4**.The distance between the holes **40** on the length of the plug-in connector **4** is the same as the distance of the axis of the sleeve **1** of the adjacent locks **3**. To properly set the holes **40,** the longitudinal edges **41a** of the plug-in connector **4** have leading projections **43**, of the size of 0.9 of the width of the longitudinal cut-out **11a** of the sleeve **1**. To strengthen the setting of the sleeve **1** in the mounting holes **50,** the constructional elements **5** in the shape of wooden beams have on their side edge a rail (**51**) and on the end face with the mounting **52**. The edge of the sleeve **1** placed in the mounting hole **50** of the constructional element (**5**) is frictionally connected on the lateral surface of the constructional element **5** with the rail **51**, on the end face with the mounting **52**.

In another example of application, to join constructional elements 5 in the corner knot, the set has a shaped connector **6** with sockets **63** for mounting locks **3.** Part of the sockets **63** is in the base wall **61** and part is in the side walls **62**, perpendicular to the wall of the base **61**.

In the example of the realisation of joining structural constructional elements using the connection set, to link two beams with the right angle, shown in Fig. 11, one end of the plug-in connector **4** is placed in the sleeve **1** placed in the mounting hole **50** in the side surface of the constructional element **5** with a rail. In the mounting holes **50** in the side surfaces of these constructional elements **5** with the rail **51** locks **3** keys **2** are placed, whose endings **20** are in the holes **40** in the flat final part **41** of the plug-in connector **4**.

In the examples of the application of the method of joining a bigger number of constructional elements, placed in one surface, the proceedings are very similar, which has been shown in the Fig. 12 in the assembling set.

In the example of the realisation of the method of joining construction elements with the use of the connection set to link a few beams, for example in the corner of the building structure with the use of the shaped connectors **6**, plug-in connectors **4** and locks **3**, in the beginning, before placing the plug-in connectors **4** and keys **2**,

in the mounting holes **50** of the constructional elements **5a**, **5b**, **5c**, **5d**, in the shape of the wooden beams, the sleeves **1** being parts of the locks **3** are placed. After placing the plug-in connector **4** in the mounting hole **50** of the first constructional element **5a**, preferably a wooden beam in the position where the axis of the hole of the plug-in connector **4** corresponds to the axis of the second mounting hole **50** of this constructional element **5a**, to the third mounting hole **50** the other end of the plug-in connector **4** or the second plug-in connector **4** is slipped to the position in which the axis of the hole **40** at the end of the plug-in connector **4** is within the axis of the fourth mounting hole **50** of the second constructional element **5c** and/or another plug-in connector **4** is slipped to another mounting hole **50** of the first constructional element **5a** to the position in which the axis of the hole **50** of this plug-in connector **4** corresponds to the axis of another mounting hole **50**, whereas the movement of the plug-in connectors **50** is blocked by at least one key **2** of the lock **3** placed in the perpendicular mounting hole **50**, after which another constructional element **5b** is moved closer and the actions are repeated until the constructional elements are joined in a node.

The proposed locks with the used systems of rails and mounting holes allow for their application not only in the construction of small buildings of the recreational, industrial and similar purpose, but also in the furniture construction, to use as the elements of shelves, cabinets and hangers. They find their application also in the general construction, with the flat adaptation, especially in the attic, in the buildings being expanded or built from the beginning with the changes thought of while the building will be used, that is planning flexible objects allowing for introducing individual changes depending on the taste. Mounting of locks is a simple activity and does not necessitate specialistic equipment or skills.

The method of the joining structural elements, with the use of the connection set, with the use of locks and plug-in connectors blocked in the holes, is instinctive and it is possible to realise it with the help of basic tools being available in every household, without the need of hiring specialists. Using standard elements makes it possible to

buy them in the number needed to the designed and mounted individually supporting construction of a small building.

Patent claims

We claim:

1. A lock of a connection set for structural elements; it has a shaped sleeve and key with tongues, **characterised in that** the sleeve (**1**) has at least one longitudinal recess, preferably a cut-out (**11a**) of the wall, connected in the bottom part with an annular recess, preferably an annular gap (**12a**) on part of the perimeter, and the key (**2**) has at least one flat tongue (**21a**) in the plane perpendicular to the axis of the rotation of the key (**2**) and is of greater length (a_2) in the end section (**20**) from the flat tongue (**21a**) than is the length (a_1) of the sleeve (**1**) from the annular gap (**12a**).

2. The lock according to claim 1, **characterised in that** the key (**2**) has an additional tongue (**21b**) shifted in relation to the first tongue (**21a**) in the same way as the distribution of an additional longitudinal cut-out (**11b**) with an annular gap (**12b**) in relation to the first longitudinal cut-out (**11a**) with the annular gap (**12a**), whereas the additional longitudinal cut-out (**11b**) of the wall is connected in the bottom part with the additional annular gap (**12b**), which is in a different distance from the end of the sleeve (**1**) than the first annular gap (**12a**).

3. The lock according to claim 1 or 2, **characterised in that** the key (**2**) has a head (**22**) equipped with a projection and/or a recess (**23**) with the press area (**23a**).

4. The connection set with locks for structural elements; it has connectors, including a plug-in connector with holes at both ends, whose movement in relation to the mounting hole in the working position is blocked with the lock, **characterised in that** the plug-in connector (**4**) in the middle of its length has a projection (**42**),

preferably annular, protruding outside the diameter of the inner hole of the sleeve (1) of the lock (3), whereas the ends of the plug-in connector (4) with holes (40) are preferably flat (41) and are more than twice longer than the sleeve (1).

5. The connection set according to claim 4, **characterised in that** the protruding from the sleeve (1) end section (20) of the key (2) of the lock (3) in the working position is placed in the hole (40) of the plug-in connector (4).

6. The connection set according to claim 4 or 5, **characterised in that** the distance between the holes (40) on the length of the plug-in connector (4) is the same as the distance of the axis of the sleeve (1) of the adjacent locks (3).

7. The connection set according to claim 4, **characterised in that** the longitudinal edges (41a) of the plug-in connector (4) have leading projections (43), preferably of the size of 0.1-0.95 of the width of the longitudinal cut-out (11a) of the sleeve (1).

8. The set according to claim 6, **characterised in that** the edge of the sleeve (1) placed in the mounting hole (50) of the constructional element (5) is additionally frictionally connected on the lateral surface of the constructional element (5) with the rail (51) and/or on the end face with the frame (52).

9. The set according to claim 6 or 7, **characterised in that** additionally it has a shaped connector (6) with sockets (63) for the locks (3), whereas part of the sockets (63) is in the base wall (61) and part is in the side walls (62), preferably perpendicular to the wall of the base (61).

10. The method of joining structural constructional elements using the connection set, with the use of flat connectors, shaped connectors and plug-in connectors blocked in the holes, **characterised in that** after placing the plug-in connector in the mounting hole of the first constructional element, preferably a wooden beam in the position where the axis of the hole of the plug-in connector corresponds to the axis of the second mounting hole of this constructional element, to the third mounting hole the other end of the plug-in connector or the second plug-in connector is slipped to the position in which the axis of the hole at the end of the plug-in connector is within the axis of the fourth mounting hole of the second constructional element, and/or

another plug-in connector is slipped into another mounting hole of the first constructional element to the position in which the axis of the hole of this plug-in connector corresponds to the axis of another mounting hole, whereas the movement of the plug-in connectors is blocked by at least one key of the lock placed in the perpendicular mounting hole, and then another constructional element is moved closer and the actions are repeated until the constructional elements are joined in a node.

11. The connection method according to claim 10, **characterised in that** in the beginning, before placing the plug-in connector and/or the key, at least one sleeve being part of the lock for the key is placed in the mounting holes.

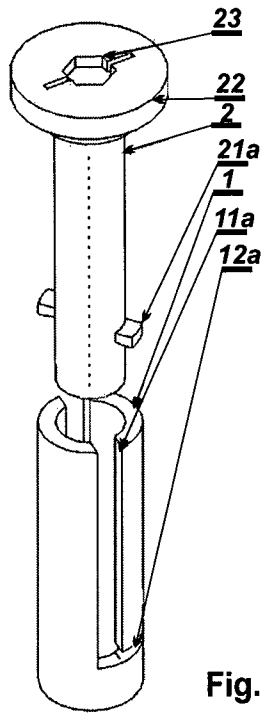


Fig. 1

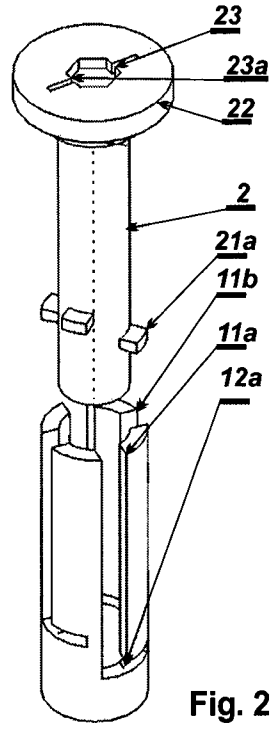


Fig. 2

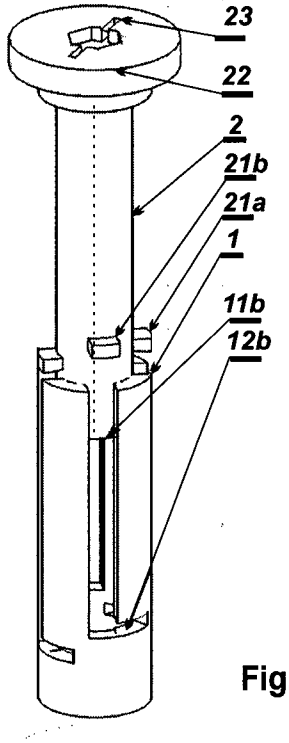


Fig. 3

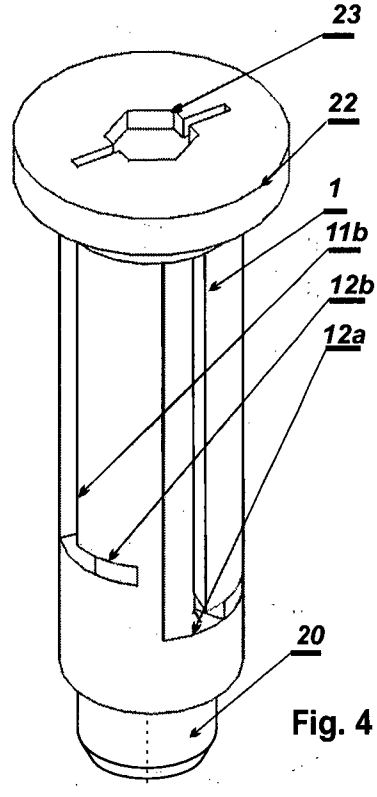


Fig. 4

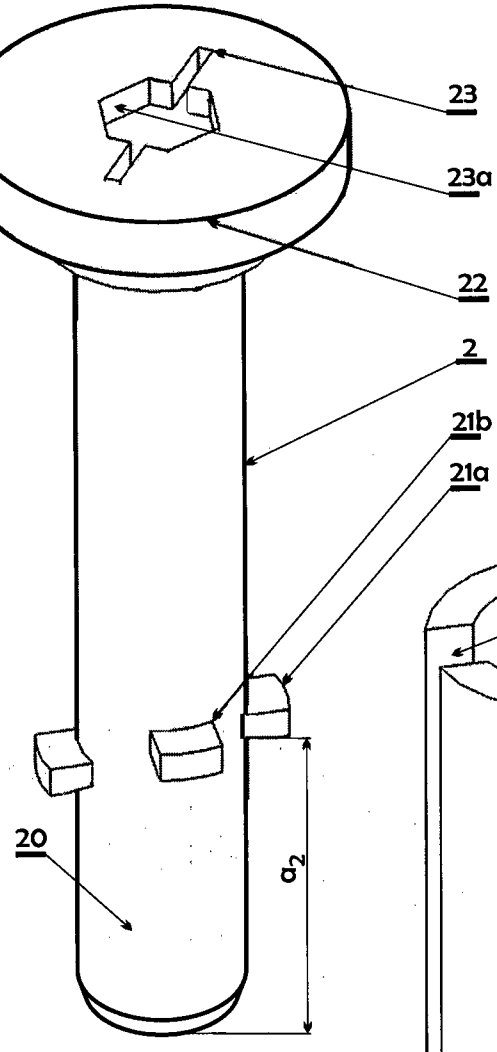


Fig. 5

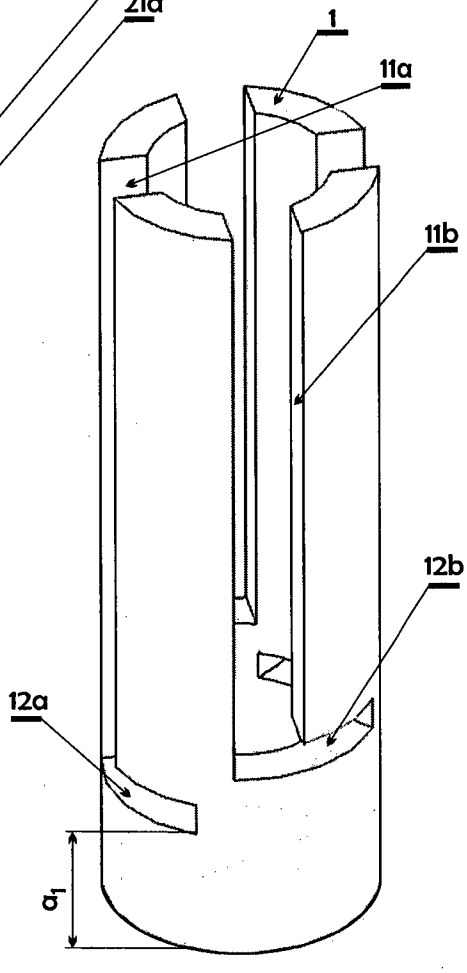


Fig. 6

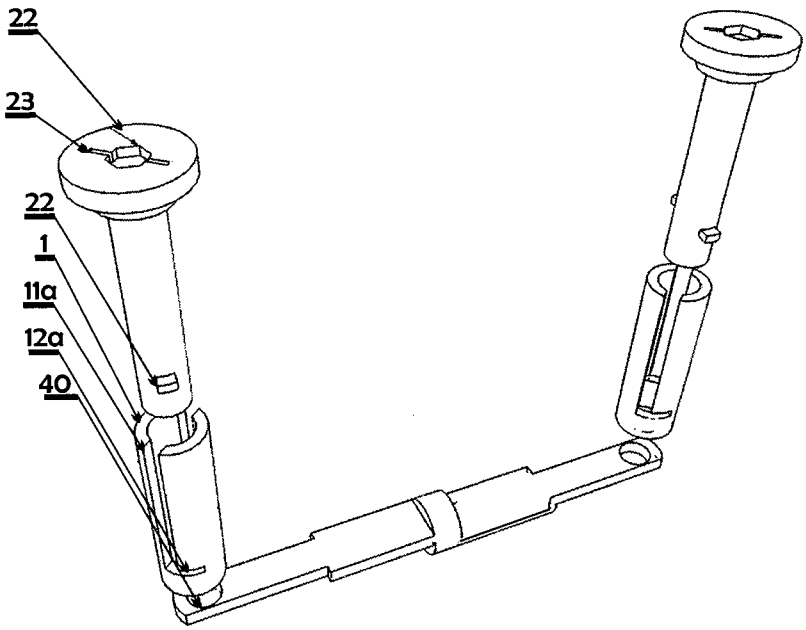


Fig. 7

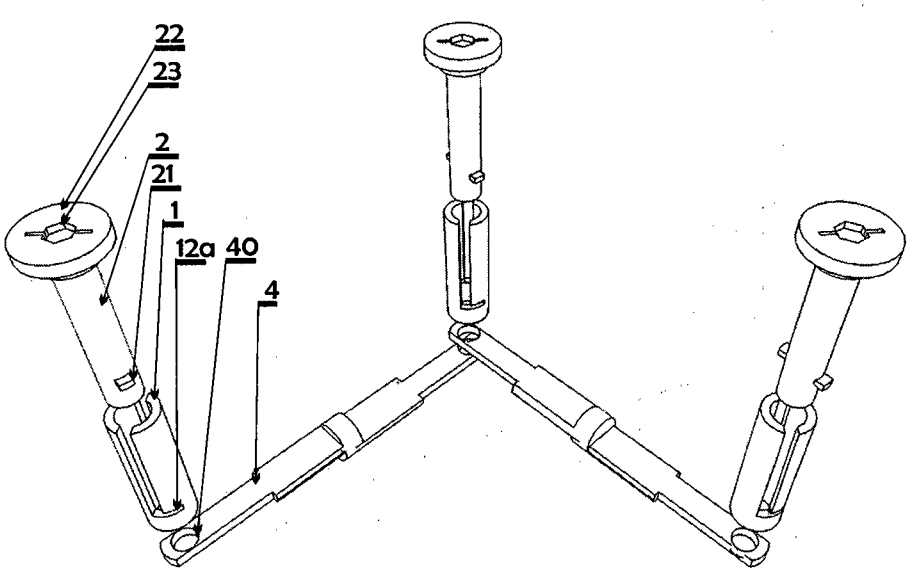


Fig. 8

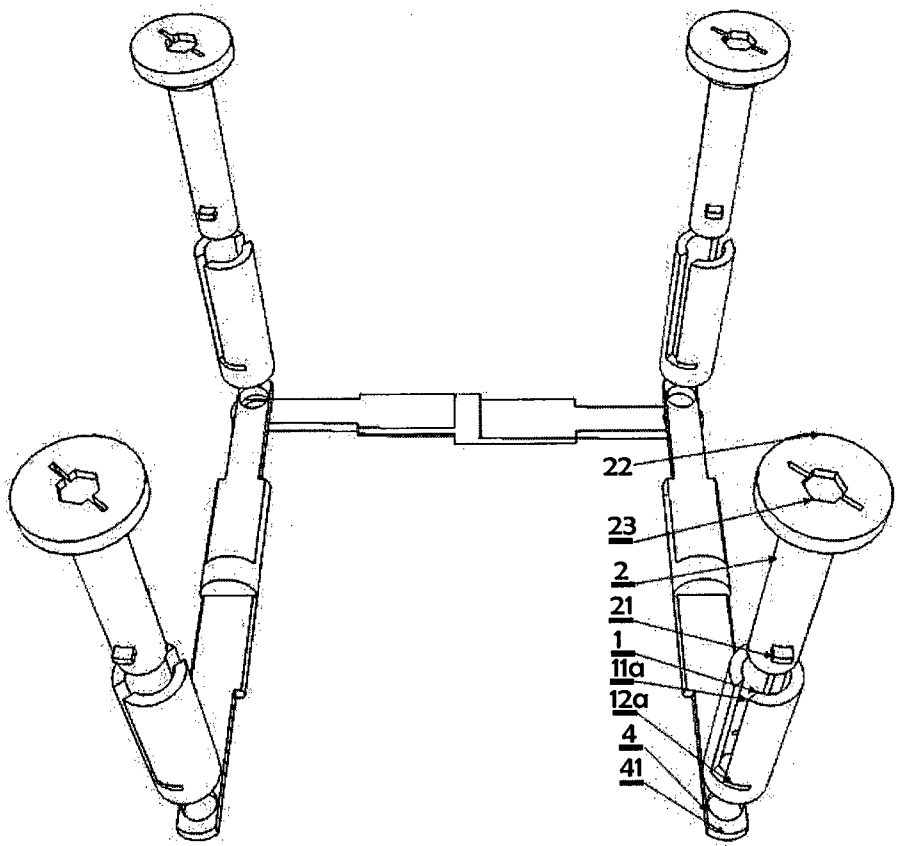


Fig. 9

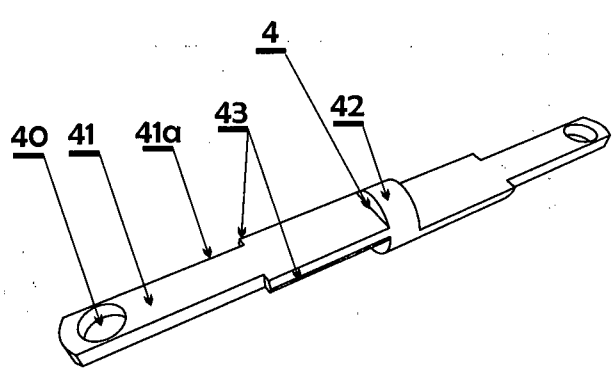


Fig. 10

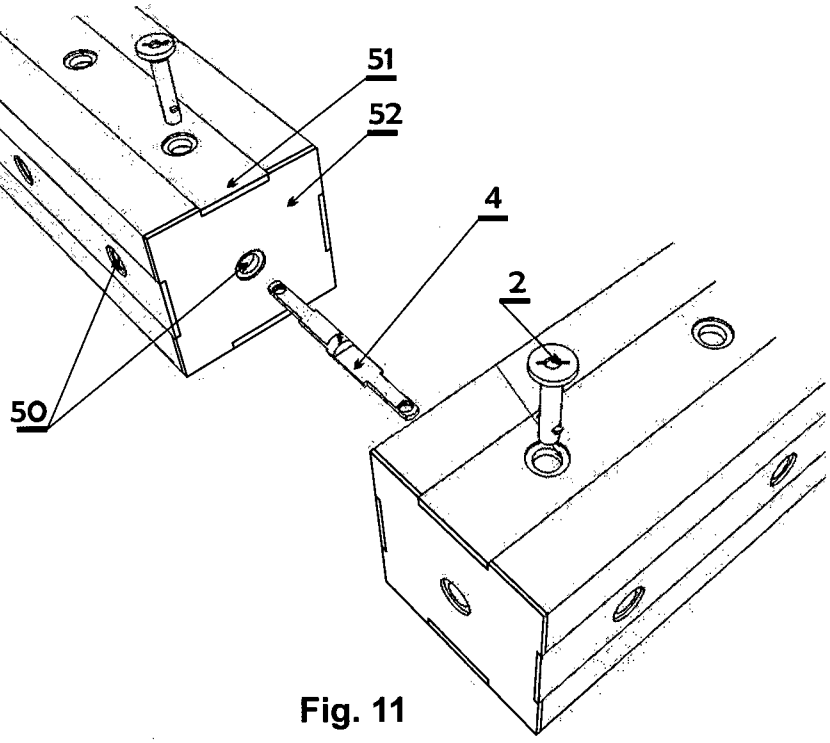


Fig. 11

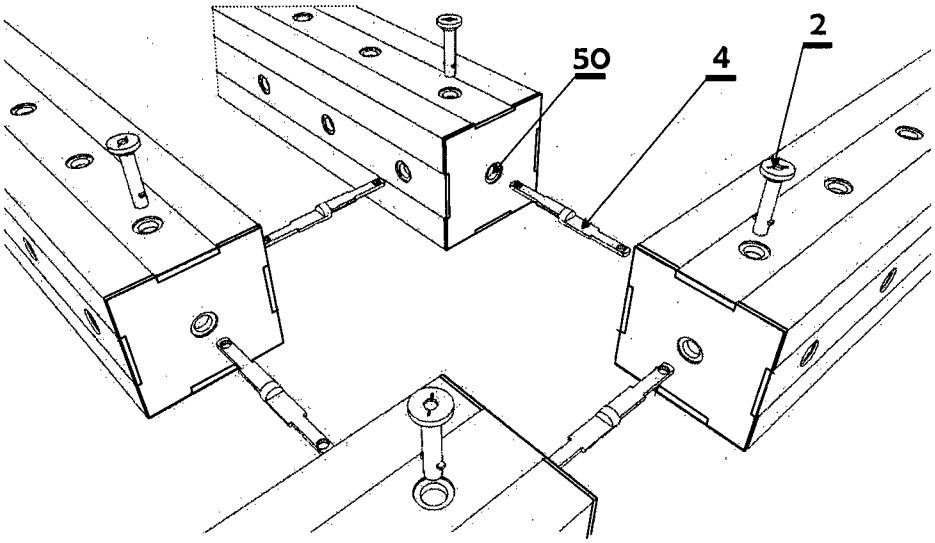


Fig. 12

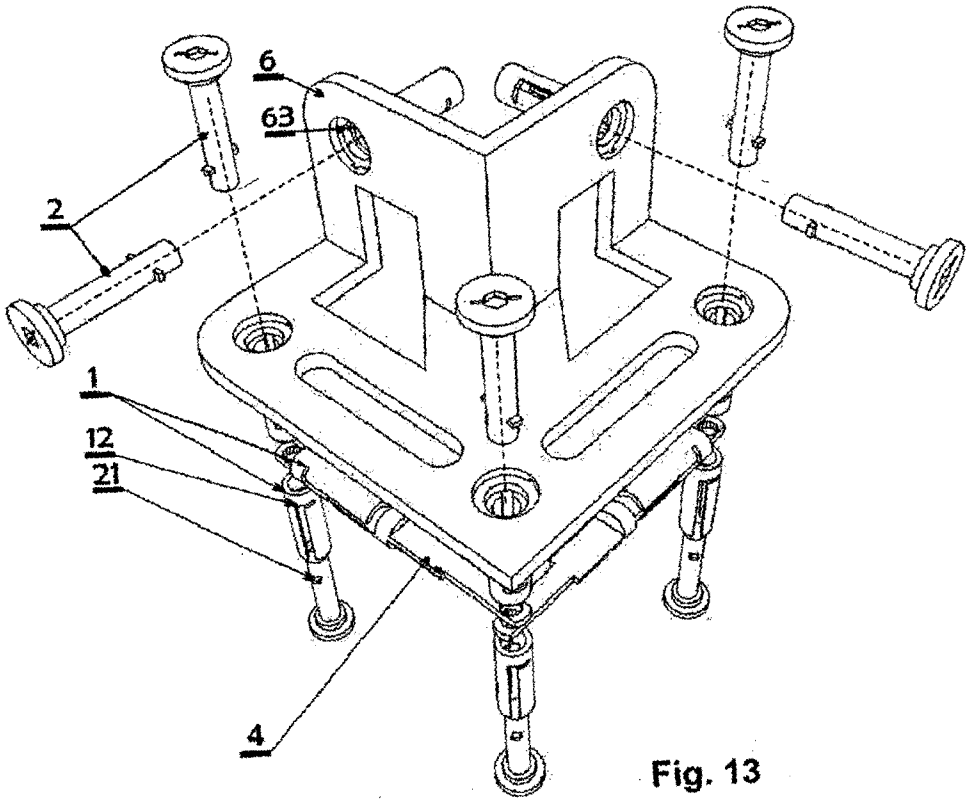


Fig. 13

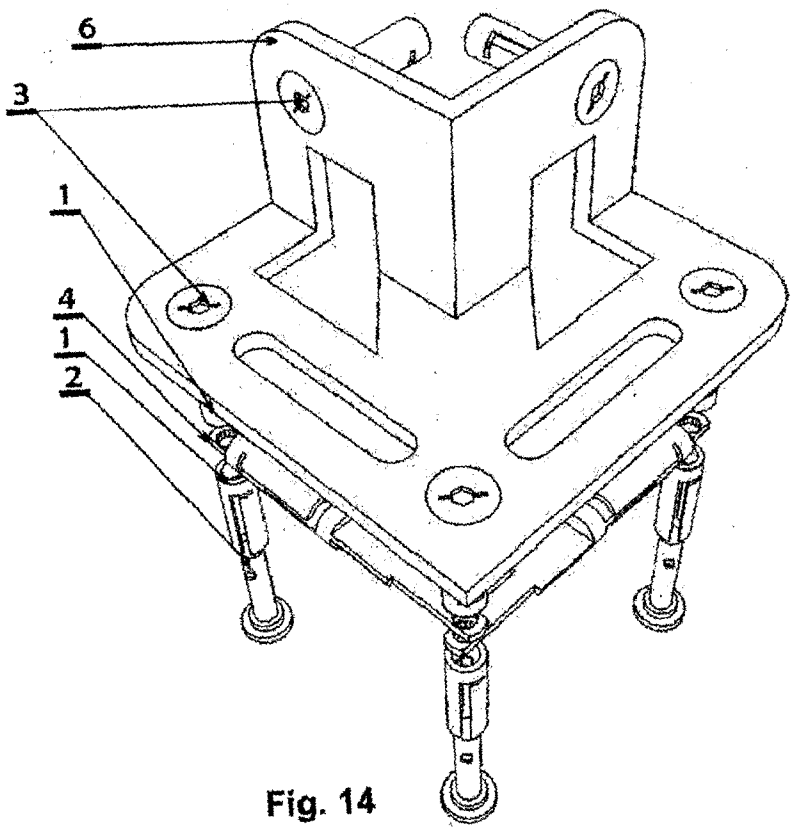


Fig. 14

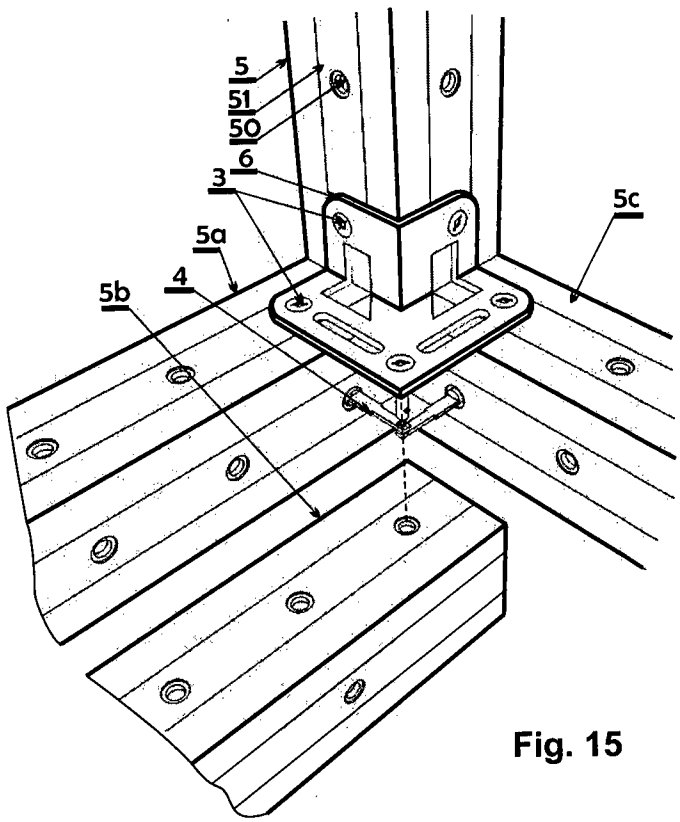


Fig. 15

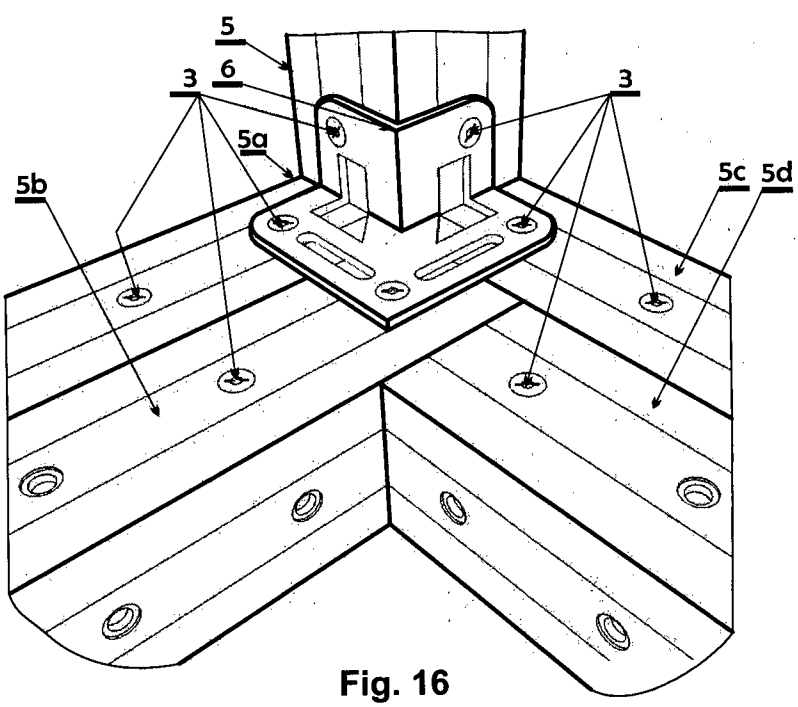


Fig. 16

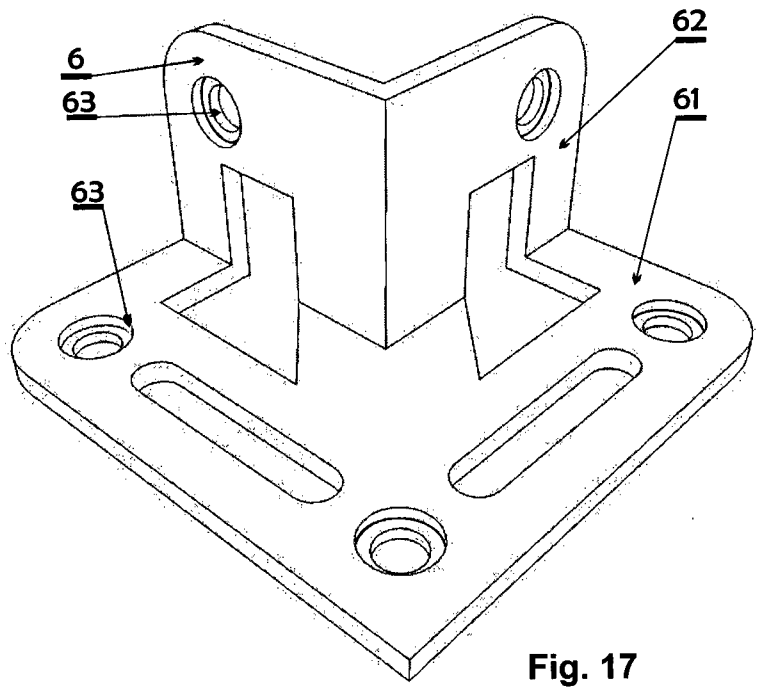


Fig. 17

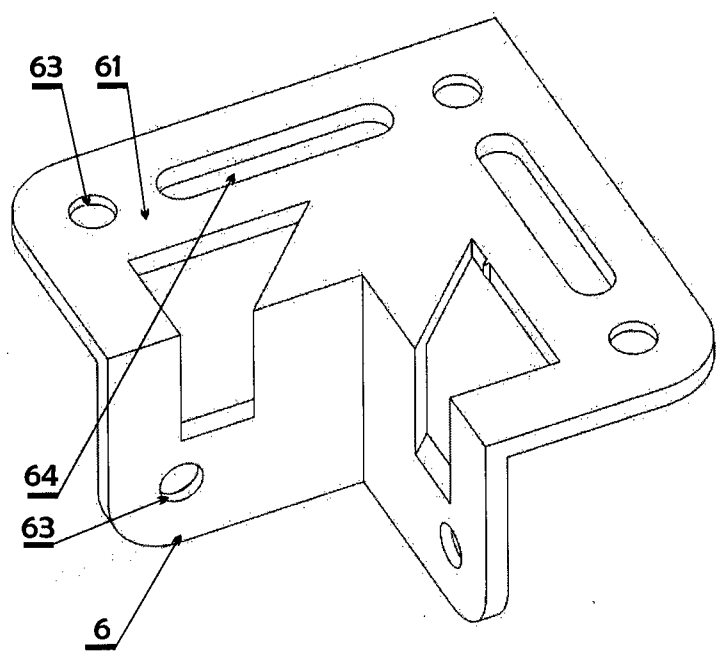


Fig. 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/PL2013/000008

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04B1/48
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 779 588 A (RAYMON R) 18 December 1973 (1973-12-18) figures 3-4 -----	1-3
X	JP 2005 200859 A (UEHARA TEKKO KK) 28 July 2005 (2005-07-28) figures -----	4-11

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 September 2013	25/09/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Pirog, Pawel

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/PL2013/000008

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3779588 A	18-12-1973	NONE	
JP 2005200859 A	28-07-2005	NONE	